RESOLVING LDEF'S FLUX DISTRIBUTION: ORBITAL (DEBRIS?) AND NATURAL METEOROID POPULATIONS. J.A.M. McDonnell, Unit for Space Sciences, University of Kent at Canterbury, Kent CT2 7NR. UK

A consistent methodology for the collation of data from both *penetration* and *perforation* experiments and from data in the *Meteoroid and Debris Special Investigator Group (M-D SIG) data-base* has led to the derivation of the average impact flux over LDEF's exposure history 1984-1990. Data are first presented for LDEF's N,S,E,W and Space faces ("offset" by 8° and "tilted" by 1° respectively). A model fit is derived for ballistic limits of penetration from 1μm to 1mm of aluminium target, corresponding to impactor masses from $10^{-18}$kg ( for $\rho_p$=2g/cm$^3$) to $10^{-10}$kg ( for $\rho_p$=1g/cm$^3$). A second order harmonic function is fitted to the N,S,E and W fluxes to establish the angular distribution at regular size intervals; this fit is then used to provide "corrected" data corresponding to fluxes applicable to true N,S,E,W and Space directions for a LEO 28.5 degree inclination orbit at a mean altitude of 465 km.

Utilising dynamical modelling techniques [1; 2], the model fluxes are then analysed on the basis of two component flux *orbital* and *meteoroid*, model with several parameters allowed to float (e.g. meteoroid velocity and the ratio of orbital to interplanetary flux). Prior to this modelling, note is taken of a space debris component (of some 15%) on the trailing West face which is identified from chemical residues [3; 4].

Parameters deduced are:

1) The meteoroid impact flux from some $10^{-15}$kg to $10^{-7}$kg
2) The average meteoroid velocity at LEO altitudes;
3) The orbital flux ( space debris ?) incident on the N, S and E directions for impactor masses $10^{-15}$ to $10^{-12}$kg.

It is shown that the meteoroid population is asymmetrical in the mass range $10^{-12}$kg to $10^{-9}$kg regarding the North - South symmetry. This is discussed in the light of likely interplanetary sources; it may demand a small number of prolific cometary sources, rather than a well mixed population.

The orbital flux, which exceeds the natural component by a factor of 4 for micro particle fluxes, is compared with NASA models, the Solar Max Mission [5] and with the results of recent revisions in the Space Debris flux [6].

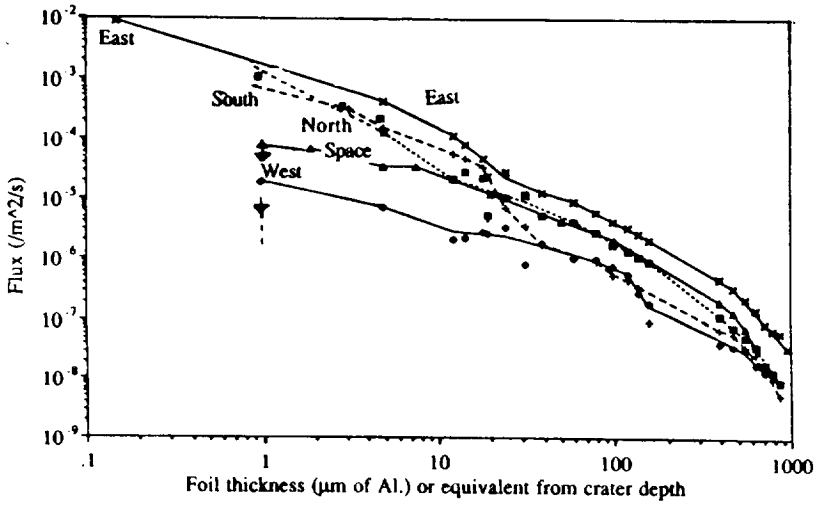


Fig.1. Ballistic limit impact data from LDEF's 4 peripheral and Space faces from the MAP experiment [7] and the M-D SIG database. Thick target data is converted using crater depth times 1.5.

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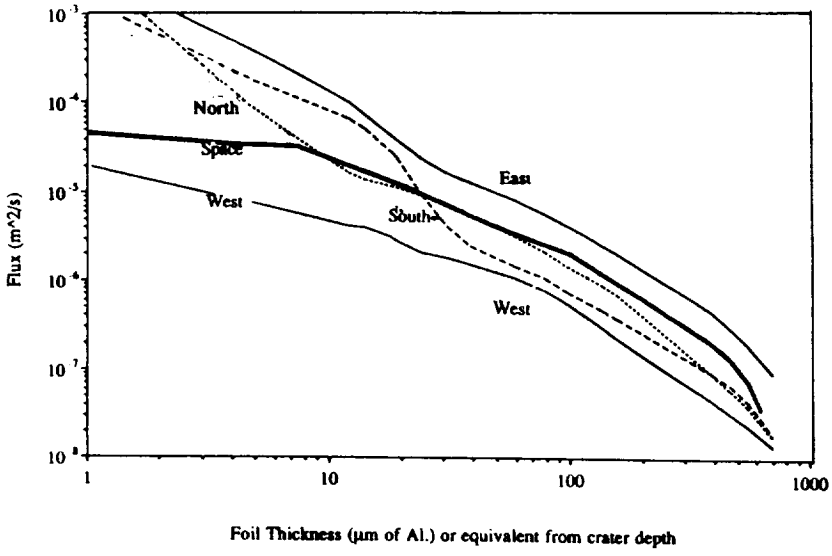


Fig.2. Model fluxes for "true " N,S,E,W directions (and Space un-corrected) relative to the orbit vector; they are derived using angular fits to data in Figure X.

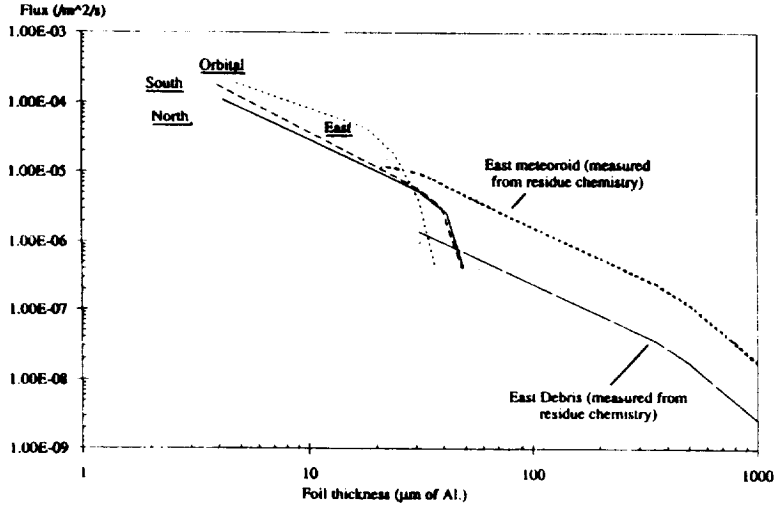


Fig.3. Populations of Orbital and Interplanetary Meteoroids derived from the 2 component modelling [8]. The **microparticle** orbital component (dominant on the East, South and North) exceeds the natural component on the West and Space faces. At larger dimensions, the debris deduced from chemical data [3] is some 15 % of the natural flux.

## References

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